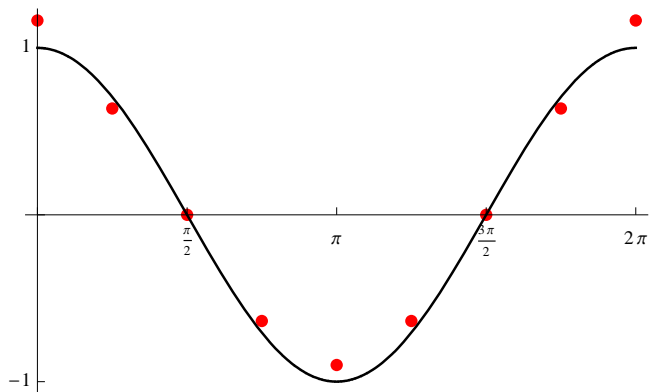


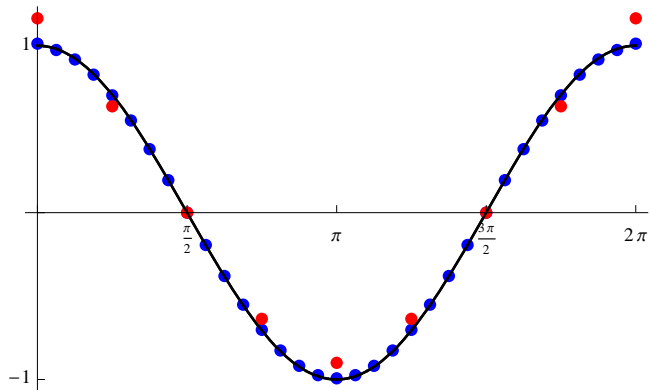
(** DERIVATE - FORMULA A TRE PUNTI E CONFRONTI VARI **)

```
Clear[f]
f[x_] := Sin[x];
df[x_] := Cos[x];

n = 8;
h = 2. Pi / n;
x[0] = 0.0;
x[n] = 2. Pi;
Do[x[i] = x[i - 1] + h, {i, 1, n - 1}]
Do[y[i] = f[x[i]], {i, 0, n}]
Do[d1[i] = (y[i + 1] - y[i - 1]) / (2 * h), {i, 1, n - 1}]
d1[0] = (-3 y[0] + 4 y[1] - y[2]) / (2 * h);
d1[n] = (3 y[n] - 4 y[n - 1] + y[n - 2]) / (2 * h);
dcalc = Table[{x[i], d1[i]}, {i, 0, n}];
ticks1 = {{0, Pi / 2, Pi, 3 Pi / 2, 2 Pi}, {-1, 0, 1}};
pp1 = ListPlot[dcalc, PlotStyle -> {PointSize[0.02], RGBColor[1, 0, 0]}, Ticks -> ticks1];
pp2 = Plot[df[x], {x, 0, 2. Pi}, Ticks -> ticks1,
  PlotStyle -> {Thickness[0.004], RGBColor[0, 0, 0]};
pp2 = Show[pp1, pp2]
```



```
Show[pp1, pp2]
```

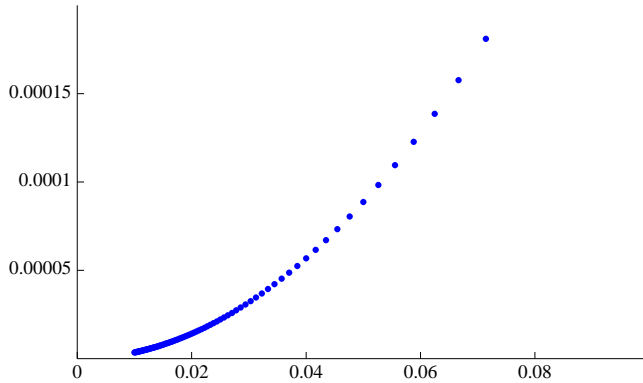


```
Clear[f]
f[x_] := Sin[x + Pi / 4];
df[x_] := Cos[x + Pi / 4];
```

```

ticks2 = {{0, 0.02, 0.04, 0.06, 0.08}, {0.00005, 0.0001, 0.00015}};
a = 0.0; b = 2.0; dftrue = df[0.5 * (a + b)]
x[0] = a;
nmax = 200;
Do[x[n] = b; h = (b - a) / n; hh[n] = h; Do[x[i] = x[i - 1] + h, {i, 1, n - 1}];
Do[y[i] = f[x[i]], {i, 0, n}];
Do[d1[i] = (y[i + 1] - y[i - 1]) / (2 * h), {i, 1, n - 1}];
d1[0] = (-3 y[0] + 4 y[1] - y[2]) / (2 * h);
d1[n] = (3 y[n] - 4 y[n - 1] + y[n - 2]) / (2 * h);
err[n] = Abs[d1[n / 2] - dftrue], {n, 4, nmax, 2}]
p11 = ListPlot[Table[{hh[n], err[n]}, {n, 4, nmax, 2}],
PlotStyle -> RGBColor[0, 0, 1], PlotRange -> {{0, 0.1}, {0, 0.0002}}, Ticks -> ticks2]
-0.212958

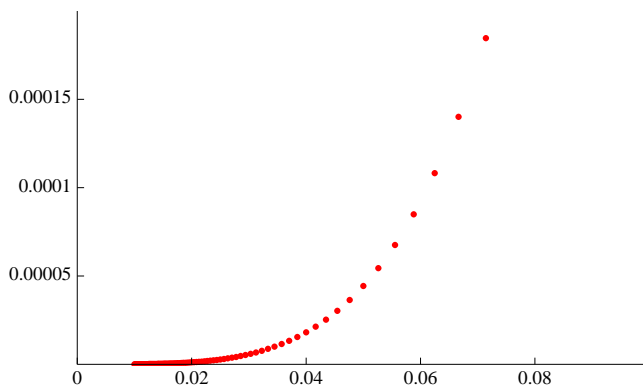
```



```

ticks3 = {{0, 0.02, 0.04, 0.06, 0.08}, {0.0000005, 0.000001, 0.0000015}};
a = 0.0; b = 2.0;
x[0] = a;
nmax = 200;
Do[x[n] = b; h = (b - a) / n; hh[n] = h; Do[x[i] = x[i - 1] + h, {i, 1, n - 1}];
Do[y[i] = f[x[i]], {i, 0, n}];
Do[d2[i] = (y[i - 2] - 8 y[i - 1] + 8 y[i + 1] - y[i + 2]) / (12 * h), {i, 2, n - 2}];
d2[0] = (-3 y[0] + 4 y[1] - y[2]) / (2 * h);
d2[1] = (y[2] - y[0]) / (2 * h);
d2[n - 1] = (y[n] - y[n - 2]) / (2 * h);
d2[n] = (3 y[n] - 4 y[n - 1] + y[n - 2]) / (2 * h);
err[n] = Abs[d2[n / 2] - dftrue], {n, 4, nmax, 2}]
p12 = ListPlot[Table[{hh[n], 1000. * err[n]}, {n, 4, nmax, 2}],
PlotStyle -> RGBColor[1, 0, 0], PlotRange -> {{0, 0.1}, {0, 0.0002}}, Ticks -> ticks2]

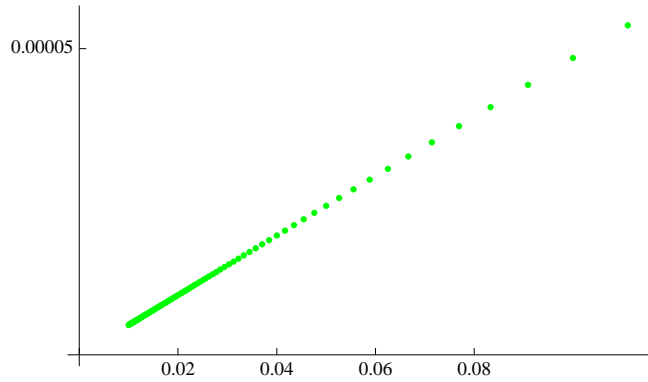
```



```

ticks2 = {{0, 0.02, 0.04, 0.06, 0.08}, {0.00005, 0.0001, 0.00015}};
a = 0.0; b = 2.0;
x[0] = a;
nmax = 200;
Do[x[n] = b; h = (b - a) / n; hh[n] = h; Do[x[i] = x[i - 1] + h, {i, 1, n - 1}];
Do[y[i] = f[x[i]], {i, 0, n}];
Do[d3[i] = (y[i + 1] - y[i]) / h, {i, 0, n - 1}];
d3[n] = (y[n] - y[n - 1]) / h;
err[n] = Abs[d3[n / 2] - dftrue], {n, 4, nmax, 2}]
p13 = ListPlot[Table[{hh[n], err[n] / 1000.}, {n, 4, nmax, 2}],
PlotStyle -> RGBColor[0, 1, 0], Ticks -> ticks2]

```



```
Show[p11, p12, p13]
```

